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The effect of particle shape on predicted segregation in binary powder mixtures

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Abstract

Particle shape driven segregation in particulate mixtures has received limited attention in the literature either experimentally or via simulation. This study investigates the shape driven segregation which occurs during the process of heap formation and evaluates the ability of different Discrete Element Method (DEM) simulation approaches to predict the effect. It shows experimentally that the difference in particle shape can drive segregation in a binary mixture and that this segregation can be predicted by DEM models which resolve the particle shape. In this case shape is resolved via a clumped sphere approach. Importantly, the work also demonstrates that simpler models using spherical particles, with rolling friction calibrated to reproduce the experimental angle of repose, tend to underestimate the segregation tendency. The system studied was a binary mixture of irregular shaped particles, a typical spray dried detergent powder and a granulated detergent additive; particle shapes were obtained using X-ray microtomography.

Key words: Granular segregation, DEM, Discrete Element Method, clumped spheres, rolling friction, spray dried powder, binary mixture

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